



# CanmetENERGY

Leadership in ecoInnovation

Spring 2009

## COMMUNITY ENERGY CASE STUDIES:

PEI Energy Systems  
Charlottetown, PEI



District Energy



Community



Biomass



Solar



Wind



CHP



Heat Pump

### Integrated Community Energy System Application

- District Energy System

### Context

- The PEI District Energy System (DES) is located in Charlottetown, Prince Edward Island with a total distributing capacity of approximately 72 MW and total electricity generating capacity of 1.2 MW.
- The system produces energy in the form of steam, hot water and electricity from three production facilities.
- The system is fuelled primarily by biomass and waste fuel. Fuel oil is primarily used for peaking and backup.

### Drivers and Rationale to do the Project

- The province has long sought alternative local fuel supply options, since most of the province's oil and electricity is imported.
- The search for local fuel sources and a proactive solution to the treatment of municipal waste led to the establishment of the DES.
- This was Canada's first biomass-fuelled hot water district heating system.

### Archetype

#### Characterization

- **Archetype:**  
*District Energy System - power, steam and hot water*
- **Density:**  
*Population of approximately 32,500*
- **Size:**  
*Building area served is over 4.5 million sq ft, over 125 buildings*
- **Mix:**  
*Residential, commercial and institutional*

## Benefits

- The system sells the electricity generated beyond that required for the system's operations to Maritime Electric Company Limited in New Brunswick.
- Revenue is also generated from waste fuel fees associated with its acceptance of municipal solid waste from Island Waste Management Corp., a Canadian crown corporation run by the Department of Transportation and Public Works.
- The system utilizes approximately 66,000 tonnes of waste materials, including municipal waste and wood waste as biomass fuel.
- Charlottetown has reduced its dependency on imported oil with 45 per cent of fuel being generated by municipal waste and 45% generated by sawmill waste.
- Estimates indicate that for every dollar spent on biomass fuel, \$0.70 stays in the local economy compared to \$0.10 for every dollar spent on oil.
- Estimates show that CO<sub>2</sub> emissions are reduced annually by 48,900 tonnes and SO<sub>2</sub> by 135 tonnes.
- The system has created new opportunities for sawmill operators.

## Project Description

- **Demand:** over 40 MWt.
- **Production capacity:** Base load 22 MW peaking and backup 51 MW.
- **Fuel type:** 41% municipal solid waste; 42% sawmill residue; 17% oil.
- **Distribution system:** 17 km hot water, thin-wall steel piping system.
- The PEI District Energy System generates steam and hot water from three plants:
  - the Energy from Waste Plant (EFPW Facility);
  - the University of PEI Facility (UPEI Facility); and
  - the Prince Edward Home Facility (PEH Facility).
- The EFPW Facility is the largest of the three plants and provides the base load for the system.
- The UPEI Facility is the main backup to the EFPW Facility, providing peak firing using fuel oil. In addition, this facility provides cooling to several buildings on the university campus through two chillers supplied with hot water from the distribution system.
- The PEH Facility, the original district energy facility, is seldom utilized but can be fired using fuel oil.
- Within each customer's building is a heat transfer station with two heat exchangers: one for the building, which circulates water at 80°C, and another smaller one for domestic hot water that operates at 50°C.

## Timeline and Status

### 1981 - 1985

Three small district heating plans were built in Charlottetown

### 1995

Province sold district energy system to Trigen Energy Canada Inc. All the systems were connected to one large district energy system and production was consolidated at one central plant in Charlottetown

### 1998

Efficiency upgrades were completed

### 2004

Addition of hot water storage and installation of economizers

### 2007

PEI Systems was previously owned and operated by Countryside Power Income Fund which was acquired by Fort Chicago Energy Partners L.P. (FCEP). FCEP is a Calgary-based income trust operating as a publicly traded limited partnership

### Future

Moderate growth is expected for the Charlottetown district energy system. Growth will depend largely on the development of new buildings.

## Considerations for Implementation and Ownership<sup>1</sup>

- The challenges encountered by the developers when integrating the Charlottetown district energy system included securing access through municipal right-of-way, specifically with regards to piping infrastructure and roads.
- Capital and long-term operating costs of a project can incrementally escalate when levies or fees are applied to plant infrastructure located in municipal or private right-of-ways.

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## Costs and Financing

- Total cost of the upgrade project in 1998 was approximately \$28 million.
- No financing information was available.

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## Relationship to Other Best Practices

- The *Prince Edward Island Energy Framework and Renewable Energy Strategy – Securing our Future: Energy Efficiency and Conservation* was developed to build on the Energy Strategy released in 2004.
  - The new document outlines an action plan to enhance the role of renewable energy and the framework around which a comprehensive provincial energy strategy will be shaped.
  - A five and ten year energy vision for PEI is included in the strategy.

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## Lessons Learned<sup>2</sup>

- Engaging local stakeholders and regulatory bodies at the beginning of the project helps establish support and may limit the impact of regulatory hurdles encountered.
- Awareness of municipal fees and tax implications at the pre-feasibility stage makes it possible to identify alternative strategies and assess cost implications.
- Optimizing existing infrastructure assets can contribute to the development of a viable and profitable district energy system.

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## Additional Information

- Additional information may be obtained from the NRCan's CanmetENERGY web site at [http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/eng/buildings\\_communities/publications/200801.html](http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/eng/buildings_communities/publications/200801.html)

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<sup>1</sup> and <sup>2</sup> <http://maps.canurb.com/cases/pei.pdf>